Mandatory Background Information

T 24 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

1. AASHTO T 24 includes procedures for obtaining specimens for many different test methods. Which of the following **is not** included in this manual?
   a. Cores for determining thickness.
   b. Sawed beams for flexural strength testing.
   c. Cores for determining splitting tensile strength.
   d. b & c
   e. a & c

2. Great care should be exercised when obtaining drilled cores. Which of the following statements regarding coring is correct?
   a. The concrete should have hardened sufficiently to prevent damage during cutting and handling.
   b. Cores used for compressive strength testing may not contain reinforcement.
   c. Cores should be drilled such that the axis is perpendicular to the bed of the concrete as placed.
   d. After cores are drilled, they must be wiped with a cloth and surface moisture should be allowed to evaporate. When the surface appears to be dry, they must be sealed in plastic bags or other non-absorbent container within one hour of drilling.
   e. All of the above.

R 39 Making and Curing Concrete Test Specimens in the Laboratory

3. After the final ingredient has been added to the mixer, what next must be done?
   a. Mix the concrete for three minutes. Allow the concrete to rest for three minutes keeping the mixer covered to prevent evaporation. Then, mix for an additional two minutes.
   b. Select portions of the batch to be used in tests and molding of specimens to be representative of the batch.
   c. Keep the sample container covered except when remixing or obtaining portions for testing.
   d. None of the above.

4. Which of the following statements about curing is correct?
   a. Flexural strength specimens must be immersed in lime-saturated water for at least the final 40 hours prior to testing.
   b. Specimens must be cured between 60 and 80˚F and must be removed from their molds within 24 to 48 hours after casting.
   c. Specimens must be stored for the first 48 hours in a location free of vibration.
   d. All of the above.
   e. None of the above.

M 201 Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in Testing of Hydraulic Cements and Concretes

5. Moist room temperatures must be carefully maintained and documented. Which of the following best describes the method of measuring and documenting curing temperatures?
   a. Curing temperature must be determined and documented by measuring the ambient temperature every hour and recording the values in a log book.
   b. Records of curing temperatures must be maintained using a recording thermometer that is calibrated at intervals not exceeding twelve months. Recording thermometers must be calibrated by comparing with a reference thermometer accurate and readable to 1.8˚F. If the temperature indicated by the recording thermometer differs from that of the reference thermometer by more than 0.9˚F, the recording thermometer must be adjusted to within that tolerance such that it agrees with the reference thermometer.
   c. Records of curing temperatures must be maintained using a recording thermometer that is calibrated at intervals not exceeding six months. Recording thermometers must be calibrated by comparing with a reference thermometer accurate and readable to 0.9˚F. If the temperature indicated by the recording thermometer differs from that of the reference thermometer by more than 1.8˚F, the recording thermometer must be adjusted to within 0.9˚F of the reference thermometer reading.
   d. Records of curing temperatures must be maintained using a recording thermometer that is calibrated at intervals not exceeding six months. Recording thermometers must be calibrated by comparing with a reference thermometer accurate and readable to 0.9˚F. If the temperature indicated by the recording thermometer differs from that of the reference thermometer by more than 1.8˚F, the recording thermometer must be adjusted to within 0.9˚F of the reference thermometer reading. Recordings of the recording thermometer must be archived to document that proper temperature control is being maintained.

6. Recording thermometers are required for water storage tanks unless which of the following actions are taken?
   a. The water is continuously circulated to keep excess lime in suspension.
   b. The tank is equipped with positive means of temperature control using tank heaters and water chillers regulated by a thermostat. Water in the tank must also be continuously circulated to maintain uniform temperature.
   c. Water in the storage tank is saturated with calcium hydroxide and stirred monthly.
   d. None of the above.

M 205 Molds for Forming Concrete Test Cylinders Vertically

7. It is important that molds be of the correct dimensions. When checking molds for dimensional requirements, which of the following **is not** required?
   a. The nominal height must be twice the diameter.
   b. No diameter of a mold may differ from any other diameter of that mold by more than two percent.
   c. Diameter at the top of the mold shall not differ by more than one percent from the nominal diameter.
   d. None of the above.

8. Which of the following statements is correct?
   a. All molds must be tested for water leakage.
   b. Reusable molds may be manufactured of aluminum or magnesium metal provided they meet all dimensional and water leakage requirements.
   c. Paper molds treated with a satisfactory waterproofing material do not have to be tested for elongation, absorption and water leakage.
   d. Standard size molds shall be 4-inch diameter by 8-inch height.

T 22 Compressive Strength of Cylindrical Concrete Specimens

9. Which of the following statements is **incorrect**?
   a. All test specimens for a given test age must be broken within the permissible time tolerances.
   b. It is always required to measure the diameter of each individual cylinder to be broken on a given day.
   c. When using neoprene caps, no loose particles may be trapped between the concrete cylinder and the neoprene cap.
   d. Specimens having a length-to-diameter ratio less than 1.8 require use of a correction factor for calculation of the compressive strength.

10. The testing machine used to break cylinders must be power operated or of the hand operated pump variety such that a single stroke of the pump is sufficient to apply the entire load to specimen failure at the prescribed rate.
    a. True
    b. False

11. Given the following data, what is the compressive strength as reported?

Cross-sectional area = πr^2

$$\text{Compressive Strength} = \frac{\text{Total Load (lbs)}}{\text{Cross-sectional Area (in}^2\text{)}} \times \text{Correction Factor}$$

Cylinder Diameter	=	5.98”	Cylinder Length	=	11.9”
Total Load at Failure	=	114,510 lbs	π (pi)	=	3.1416

    a. 4077 psi
    b. 4075 psi
    c. 4080 psi
    d. 6095 psi
    e. Insufficient information is provided. A correction factor is needed.

T 97 Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

12. This method involves determining flexural strength by applying a diametral compressive load along the length of the specimen.
    a. True
    b. False

13. Which of the following statements is correct?
    a. The loading apparatus includes load-applying blocks spaced apart three times the specimen depth as tested.
    b. The load-applying and support blocks must extend across the specimen within 0.05” of the full width. They must have surfaces that do not depart from a plane by more than 0.02 inches.
    c. Leather shims are always required to assure proper specimen and load bearing.
    d. Specimen width, depth, and location of fracture are measured after testing. Each of these must consist of the average of three measurements determined to the nearest 0.05 inch.
    e. All of the above.

14. A beam of six inch by six inch nominal cross section is tested. Given the following information, and using the correct formula, what is the modulus of rupture? Given the information provided, was this a valid test method for the specimen described (Yes/No)?

$$R = \frac{P\,l}{b\,d^2} \quad \text{or} \quad R = \frac{3\,P\,a}{b\,d^2}$$

where:

R	=	Modulus of rupture			
P	=	maximum load, lbs	P	=	7130 lbs
l	=	span length, inches	l	=	18.00”
b	=	average specimen width, inches	b	=	6.05”
d	=	average specimen depth, inches	d	=	6.15”
a	=	line of fracture to nearest support, inches	a	=	8.40”

a. 560 psi - - No
b. 561 psi - - Yes
c. 785 psi - - No
d. 780 psi - - Yes

If the test was not valid, why is this the case?

T 231 Capping Cylindrical Concrete Specimens

15. According to this FOP which of the following materials may be used to cap cylindrical concrete strength specimens?
    a. High strength gypsum plaster or sulfur mortar.
    b. Neat cement paste.
    c. Plaster of paris.
    d. a & b
    e. All of the above.

16. Which of the following statements about use of high strength gypsum plaster for capping specimens is true?
    a. The capping material must be tested periodically to assure that the minimum strength of 4000 psi is achieved. The proportion of water to gypsum plaster as used must be in the range of 38 to 40 percent by mass of gypsum plaster.
    b. Only glass plates of at least ¼-inch thickness may be used when capping with gypsum plaster.
    c. Use of alignment devices is not required to maintain cap faces perpendicular to the axis of the specimen.
    d. Capped specimens should not be stored in moist rooms longer than four hours after capping and capped surfaces must be protected from dripping water.

17. After capping, it is not required to maintain moist-cured specimens in a moist surface condition provided that they are tested within four hours after capping.
    a. True
    b. False

C 1231 Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders

18. Which of the following statements about use of unbonded caps is true?
    a. Unbonded caps may only be used for strength levels up to 7000 psi.
    b. It is not permissible to test a cylinder having one end prepared according to T 231 and the other end capped with an unbonded cap.
    c. The maximum number of reuses of neoprene pads for strength level of 4000 to 7000 psi is one hundred.
    d. a & c
    e. a & b

19. Use of neoprene pads is permitted for strength levels above 12000 psi only if qualification tests indicate compliance with the provisions of this FOP, and pads proposed for use have a Shore A Durometer hardness of 80.
    a. True
    b. False

20. According to this FOP, when using neoprene pads in an unbonded capping system…
    a. specimens may be of either four-inch or six-inch nominal diameter.
    b. the pads must be 1/2 inch or more in thickness.
    c. cores having a diameter of 3.75 inches may be tested using the capping system for 4-inch specimens.
    d. All of the above.
    e. None of the above.